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VETERINARY JOURNAL

Editor:

FREDERICK HOBDAY, C.M.G., F.R.C.V.S., F.R.S.E.,

HONORARY VETERINARY SURGEON TO HIS MAJESTY THE KING;
MAJOR IN THE ROYAL ARMY VETERINARY CORPS
HONORARY MEMBER OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION
CORRESPONDANT ÉTRANGER DE LA SOCIÉTÉ DE MEDECINE VÉTÉRINAIRE DU BRABANT (BELGIUM).

Sub-Editor:

GLADSTONE MAYALL, M.R.C.V.S.

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Editorials.

THE MINISTRY OF HEALTH.

THE happiness and progress of a nation depends very largely on its health. The advancement of its science and art, the putting forth of the highest amount of physical effort in manual work, the keenness and good quality of the brain are all matters of a sound mind in a healthy body. Material things have always been more under the care, control, and direction of the State than bodily and mental qualities. Ignorance of the importance and value of these latter factors has existed in a very large measure because leaders, teachers, and men and women of eminence have never taken a full view of their duties in this respect. The high percentage of failures of the manhood of the nation to come up to the A1 standard for military requirements has been an eye-opener to the statesmen and politicians, and there is an indication at present that the bodily and mental health of the nation needs overhauling, and that measures are to be taken with a view to raise the standard of the country's general health and physical fitness. Physiology, hygiene, and a knowledge of eugenics must all be more largely explained and taught to the rising generation and discussed with them than has been the case in the past. The matter of health of a community or nation cannot be approached merely from the point of view of concentrating on the cure and treatment of human ailments. Any true view of health will not be limited to a watertight compartment comprising the human element only.

Outside factors bearing on the origin and spread of disease must be considered. A Health Ministry without a veterinary element in it will be very incomplete and imperfect. It will do us good as a body to be represented in this Ministry. We think we deserve to be in it, and any honest, modern Minister who forms his Council will see that we are not overlooked. He may want enlightenment as to the grounds for our request to be granted, and it may be well to try and enumerate some of them. The past record in the stamping out of rinderpest, pleuro-pneumonia, rabies, and the reduction of cases of glanders and tuberculosis needs to be brought to the notice of those who form the Health Ministry. A comprehensive list of the diseases communicable from animals to man might be drawn up and advanced on our behalf. Few people outside the veterinary profession really know much about the transmission of disease from animals to man, and, conversely, there is a good deal of ignorance shown about the transference of disease from man to animals. Contact, intermediate carriers, a bite, blood-sucking insects, parasitic meat, animal secretions, parasites are all factors in the transmission of disease from animals to man. Human health is in danger from a very large number of animal complaints, *e.g.* rabies, tuberculosis, anthrax, mange, ringworm, cow-pox, tetanus, foot and mouth disease, glanders, trichiniasis, Malta fever, pus infections, bubonic plague, sleeping sickness, and there are a whole rank of animal parasites that may transmit disease to man or act as intermediate carriers of disease from animals to man. In many cases lower animals may be the only agents in the spread of disease, and they may be " healthy " or diseased carriers. The study of disease should be at least as broad as the study of botany and zoology, and a Ministry of Health, to be effective, must take a very broad view of pathology. The control of disease means an intelligent understanding and carrying out of sanitary procedure by the laity, and the practising veterinary surgeon knows what a tremendous amount of room there is for a spread of knowledge in this respect among the public. The matter is so important that it might be made a subject regularly taught in our elementary schools. Minds alive and eager will find great pleasure in being able to understand interesting scientific principles. The laggard and offender may have to be whipped into shape by strict laws and regulations, but enthusiasm for health will find the greatest pleasure and interest in a Department of " Science for the Laity " as a branch of the Ministry of Health.

G. M.

ANIMALS' ANÆSTHETICS BILL.

THIS Bill was read a second time in the House of Commons on May 2nd. A similar Bill was before the House in 1913, but apparently it did not become law. The operations in respect of which the use of anæsthetics are compulsory will be set forth in a schedule which will presumably be drawn up with the help of advice from veterinary surgeons. Lieut.-Colonel Walter Guinness, of Bury St. Edmunds, is the promoter of the Bill. The present practice of the castration of colts is not to be interfered with, but in the case of horses two years old and over an anæsthetic must be used. This will mean that the castration of adult stallions standing will not be permitted, and in parts of the country where colts are left until they are two years old before being operated on, anæsthetics will have to be used. Mr. Horatio Bottomley and Sir Watson Cheyne were among the noted advocates of the Bill.

We hope that a distinction will be made in the case of operations in which it is advisable and desirable that local anæthesia takes precedence over general anæsthesia. The operations named in the schedules of the 1913 Bill were:—Radical operation for quittor, line firing, operation for stripping the sole, radical operation for poll evil, radical operation for fistulous withers, castration, ovariotomy, neurectomy, enucleation of the eyeball and trephining.

There may be objections to the use of general anæsthesia both for line firing and trephining. The continued pain of anuntreated lameness where firing is necessary, but the procedure for general anæsthesia is dangerous, may easily be greater than the transient pain caused by firing without an anæsthetic or the discomfort caused by the use of a local anæsthetic.

We expect that the Parliamentary Committee of our Council is watching the Bill, and we hope that the veterinary profession as a body is being consulted in the matter. G. M.

Original Communications.

"BIPP" TREATMENT.

BISMUTH IODOFORM PASTE.

By E. S. W. PEATT, Capt. R.A.V.C.

IN an article in the *British Medical Journal* of 20th October, 1917, Dr. R. Morrison, Professor of Surgery, Durham, called attention to the value of the paste commonly known as "Bipp," in the "treatment of infected, especially war, wounds."

He claimed that by its means a revolution in the treatment of infected wounds had been effected. To quote his words: "If anyone had told me two years ago that it was possible to treat large infected

wounds in such a manner that they required no special drainage ; that they could be safely closed by suture at any period of their progress, and that the dressings used for them could be left unchanged for from one to six weeks with the knowledge that the healing was making steady progress, I could not have believed it."

This system of treatment appeared to be so specially applicable to veterinary surgery that instructions were issued by the War Office early in 1918 for its trial in all theatres of operations. The results have been generally satisfactory, and the following report by Captain E. S. W. Peatt, R.A.V.C., is now published, describing the use of Bipp in the Salonika Expeditionary Force.

"BIPP" TREATMENT OF WOUNDS IN VETERINARY SURGERY.

Bismuth Iodoform Paraffin Paste, or Bipp, is prepared as follows :—

Rx Iodoform	16 ozs.
Bismuth Subnitrate	8 ozs.
Liquid Paraffin	8 ozs. or a sufficient quantity.

The iodoform and bismuth are mixed in a mortar and liquid paraffin added till a thick paste is formed. This paste is then rubbed down on a slab to get rid of lumps and grit.

Preparation of the Wound.—Before applying Bipp to a wound the latter should be thoroughly cleansed. This is done mechanically, by removing all foreign bodies, loose pieces of bone and diseased tissue, jagged and diseased bones remaining being curetted and good drainage ensured. Both the wound and the surrounding skin should then be mopped with petrol and dried.

It is an advantage to mop a wound dry with gauze before applying Bipp, otherwise a lot is wasted in the form of discharge from the wound, and also the paste does not permeate the tissues so well on rubbing, if they are moist.

Bipp should not be applied to a wound immediately after operation if there is a lot of hæmorrhage. It is better to plug the wound with gauze, only smearing a little of the paste over any diseased spot, and to re-dress the wound properly in 24 hours, when hæmorrhage has ceased.

Method of Application.—The paste is well rubbed into the wound under treatment with a piece of gauze or a clean finger, care being taken that the most remote parts of the wound are reached. Extra attention should be paid to those areas of the wound known to be the seats of infection, *i.e.*, where necrosed bone or other tissue have been removed such places receiving a more thorough application.

If there is little or no discharge from a wound it can be sealed up after smearing with Bipp, by plugging or even suturing. This was done in the case of some operation wounds, *i.e.*, quittors, punctured

feet, etc. If the discharge is profuse at first, it is better to leave a drainage opening till it becomes less. If a wound is sutured, Bipp should be smeared along the line of sutures, outside as well as inside the wound, to prevent infection gaining entrance. It is particularly useful in a case where healing by first intention is desired, used as described above, *e.g.*, in Cherrie's Operation, Entriopion Operation, or any clean-cut skin wound.

The quantity of Bipp used at a dressing should be small. After rubbing in the paste as described, all excess is removed, only a thin film remaining on the surface of the wound. Dressers require careful supervision, otherwise they use too much.

The length of time allowed to elapse before a wound is re-dressed with Bipp varies with the type of wound. If it is a fairly clean wound, with little discharge, it can be left longer than a wound with copious discharge. In the latter case the purulent discharge carries the Bipp out of the wound with it.

If a wound dressed with the paste shows no inflammatory symptoms and the patient no constitutional disturbance, the dressing can be left on for periods varying from 5 to 14 days. After some experience in the use of Bipp the time between dressings was prolonged, in certain cases, from 4 to 8 or 10 days with as good results, and we believe that in many cases an even longer period between dressings could be allowed and still get as good results.

My experience of Bipp is short, only extending over a period of three months, during which time we treated about fifty cases, only two of which did not recover. Some of the wounds healed very rapidly, *e.g.*, quittors in three weeks; foot cases in general did well. It also appears to be a very suitable dressing for injuries to bones. Two cases of hæmatoma of the ear, which would not respond to other treatments, when treated with Bipp healed up after two dressings.

Personally I consider Bipp treatment to be a most useful innovation to veterinary surgery, and in its favour quote the following points :—

(1) The paste remains in a wound longer than other antiseptics, *e.g.*, liquids, on account of its adhesive nature.

(2) Wounds have not to be dressed so often, and so labour and dressing materials are saved.

(3) It is non-irritant to the tissues, as shown by the fact that it can be sutured up in a wound and healing by first intention result. It appears even to have a sedative action on an inflamed wound, lessening the pain.

(4) It makes healing by first intention of a clean operation wound in veterinary surgery more certain, *e.g.*, Cherrie's Operation, Entropion Operation, or any other skin wound.

(5) The results of the treatment are excellent.

(6) The cost of the paste is more than compensated for by the fact that fewer dressings are necessary, and the wounds heal very rapidly.

The quantity of Bipp used is not great. For the successful treatment of fifty cases, including those in the attached summary, between 4 and 5 lbs. were used.

"Bipp" Treatment as compared with "Carrel" in Veterinary Practice.

These two methods of treatment, both giving excellent results, differ in certain points:—

(1) In respect to the type of wound for which each is suitable, Bipp can be used in any wound, whereas Carrel treatment cannot, on account of the difficulty of keeping the tubes fixed in the wound, *e.g.*, in a punctured foot, unless there is a communicating wound above the coronet, it is impossible to keep a Carrel tube in position. The same applies to wounds of very mobile parts of the body and parts difficult to bandage, *e.g.*, the ear; it is also difficult to keep a tube in a vertical wound opening downwards, *e.g.*, a dental fistula of the lower jaw. In all these cases Bipp is the better treatment.

(2) Bipp is the more suitable dressing in punctured wounds from which there is not an excess of purulent discharge, and which can be plugged, *e.g.*, picked up nail. It is also preferable in operation wounds which it is desired to keep aseptic, and in which healing by first intention is expected, especially if the wound is sutured.

Carrel treatment, on the other hand, is more effective than Bipp in the more septic and larger types of wound with profuse purulent discharge, and in conditions which must be treated as open wounds. Here the continuous instillation of eusol rapidly cleanses the wound both by its mechanical and chemical actions.

Whereas, if Bipp were used in this latter case, too frequent dressings and a large quantity of the paste would be required, and the treatment would not be economical, because the area so to be dressed is extensive and the paste would rapidly be carried out of the wound in the discharge.

(3) In Bipp treatment fewer dressings and less attention to the wound between dressings are required.

(4) Eusol is very cheap, whereas Bipp is expensive, but more dressing materials and apparatus are necessary for Carrel treatment.

(5) Bipp gives the more rapid results in most cases.

SUMMARY OF RESULTS OF SIXTEEN CASES TREATED BY "BIPP."

Case No.	Animal.	Condition.	Operation.	Treatment.	Treatment Started.	Animal Discharged.
1.	Bay Geld. Rider.	Sinus in the flank, opening at the external angle of the ilium, going vertically down for 8 inches and discharging a lot of pus.	Made an opening at the bottom of the sinus and curetted the lining.	Rubbed Bipp into the walls of the sinus and plugged both openings, covering the whole wound with a piece of cotton wool stuck on the skin with gum. Took off the dressing in 4 days, and there was no discharge. Re-dressed every 4th day, and after the 4th dressing the wound was healed.	7/11/18.	30/11/18.
2.	Grey Geld. Rider.	Large septic wound below the stifle in the muscles of the second thigh, with a deep sinus to the bone.	Opened up the sinus and curetted, cleaning up the surface of the wound by scraping and scrubbing with petrol.	Rubbed in Bipp every 4th day. There was no discharge after the first dressing, and the sinus healed after the 3rd dressing, leaving only a skin wound which healed in 10 days.	8/11/18.	30/11/18.
3.	Brown Geld. Mule.	Lacerated wound of the off fore leg, exposing the cannon bone for 2 inches. The wound was 2¼ ins. long and 1½ ins. wide.	Removed ragged tissue and soaked with petrol.	Applied Bipp and covered up the wound with a pad and bandage. Dressed every 4th day for 3 times. After the 3rd dressing the wound was filled in and the bone covered. The wound was dressed twice after this at an interval of 5 days.	19/11/18.	12/12/18.

Case No.	Animal.	Condition.	Operation.	Treatment.	Treatment Started.	Animal Discharged.
4.	Bay Geld. L.D.	Contused wound on the outside of near hock. The injury had caused exudation of blood and destruction of the tissues under the skin, so that a large nodular swelling had come up and burst at five different places, a bloody fœtid liquid being discharged from these openings.	Opened up the cavity for a short distance at its most inferior point and cleaned out the wound with a spoon.	The interior of the cavity having been dried with gauze, and there being little hæmorrhage, Bipp was applied in the usual way. In 5 days' time the dressing was removed and all the wounds were healed except one; the wound was redressed and left for 5 days, at the end of which time all five wounds were completely healed. This was a surprising result, as it appeared almost certain that the skin over the hock would slough off.	28/12/18.	9/1/19.
5.	Brown Geld. Mule.	Vertical sinus 2½ inches deep, with no drainage, in the muscles below the external angle of the illium, pus being discharged.	Did not operate, as this was an experimental case to see if the wound would heal without drainage.	Mopped out the wound thoroughly with petrol, dried, and applied Bipp with the finger, plugged the wound, and left it for 5 days. At the end of this time the wound was healed except for a slight skin wound, which was dressed with dry dressings. The discharge ceased after Bipp was applied.	1/1/19.	7/1/19.
6.	Chest. Mare. L.D.	Quittor near hind foot, a discharging sinus being present on the outside of the near hind coronet at the level of the lateral cartilage.	Rasped down the wall of the affected quarter, probed the sinus and made a small triangular window in the wall opposite the bottom of the sinus, removing a piece of ne-	After the operation the wound was plugged with gauze, smeared with a little Bipp, and a bandage put on. Next day, hæmorrhage having ceased, Bipp was applied to the lining of the entire wound,		

			crosed cartilage from here. Curetted the remaining cartilage round the diseased spot and made the wound in the wall communicate with that above the coronary band, by cutting out the sinus with a punch.	being well rubbed in; the wound was then bandaged over, after the two openings had been plugged with gauze. In 3 days the dressing was removed, and there was no discharge, the wound looking perfectly clean. It was then dressed at the following intervals—4, 5, 6, and 7 days. After the last dressing the wound was perfectly healed, and the mare was discharged a week later going sound.	9/11/18. 12/12/18.
7.	Chest. Geld. L.D.	Quittor off hind foot, affecting the inner cartilage.	This horse had been operated on before. I re-operated by the method described in No. 6.	The wound was "Bipped" the day after operation, as described in No. 6, and redressed every 5th day. Discharge ceased after the second dressing, and after four dressings the wound was healed, only the wall had not yet grown down.	6/12/18. 10/1/19.
8.	Brown Mare. Mule.	Dental fistula. The opening of the sinus was on the near side ramus of the lower jaw, and on probing, the probe encountered the fang of the 2nd lower molar.	Enlarged the opening of the sinus, removed several pieces of necrosed bone and curetted the interior of the sinus.	After the operation the wound was plugged with gauze for 24 hours, then mopped out with petrol, dried, and Bipp applied, the opening of the sinus being plugged with gauze. The wound had no discharge after the first dressing; it was dressed every 4th day, and after the third dressing healed up. This was a very rapid recovery.	9/11/18. 25/11/18.

Case No.	Animal.	Condition.	Operation.	Treatment.	Treatment Started.	Animal Discharged.
9.	Brown Geld. Mule.	Fistula of the wither. A sinus discharging pus was present on the off side of wither.	Opened up the sinus, which travelled in a downward direction, removed necrotic tissue and ensured drainage. The spines of the vertebræ were not affected, and the operation wound was small, about 4 inches long.	Bipp was applied as usual the day after operation, and the dressing kept on by a square of calico tied by tapes in front of the neck and under the thorax. The wound was dressed every 5th day and healed up after four dressings.	19/11/18.	15/12/18.
10.	Brown Geld. Mule.	Fistula of the wither. A large swelling was present over the wither, with a discharging wound on the near side.	Opened up the sinus vertically and found the tops of two vertebral spines diseased. Made another vertical incision parallel to the first one, removed all necrotic tissue between the two and curetted the diseased spines.	The wound was "Bipped" the day after the operation and re-dressed every fifth day, the openings being plugged with gauze and covered as described in No. 9. The wounds were healed after seven dressings.	23/11/18.	28/12/18.
11.	Brown Geld. Mule.	Fistula wither. A large swelling being present on the wither and a sinus discharging pus on the near side.	On probing, the sinus proved to travel across the wither to the off side, where an abscess had formed. A "T" shaped incision was made on the off side, the top of the "T" over the affected area and parallel to the middle line of the back and about 2 inches below it, the incision going right down to the ver-	After the operation the wound was plugged with gauze through the opening of the sinus still present on the near side. The next day the wound was thoroughly cleared of all blood, dried, and treated with Bipp, which was introduced through the opening on the near side and rubbed in with the finger, or gauze lapped round the end of a long		

			below it, the incision going right down to the vertebral spines, two of which were diseased. A vertical incision was then made at right angles to the foregoing opposite the diseased vertebræ and about 5 inches long, as deep as the first incision at the top, but gradually getting shallower towards the bottom. The two flaps of skin isolated by this incision were reflected back, thus exposing the whole diseased area, from which all neurotic tissue was removed, including the tops of the two vertebral spines, the stumps remaining being curetted. The "T" shaped incision was then sutured up, excepting an opening at the bottom of the vertical incision for drainage.	the finger, or gauze lapped round the end of a long forceps. The opening was then plugged and Bipp smeared over the sutures of the "T" shaped wound and the whole covered as in former cases. The wound was dressed every 4th day for four times; then, there being no discharge, it was prolonged to every 6th or 7th day. The sutured wound healed up in 16 days, only a small sinus remaining at the bottom of the vertical incision, which healed up two weeks later.	5-12-18. 10-1-19.
12.	Brown Geld. Mule.	Fistula wither. The sinus was on the off side, and two vertebræ were diseased,	The sinus, on probing, proved to travel forwards 6 or 8 inches, parallel to the middle line of the back and about 1 inch below it, on the off side. A "T" shaped incision was made as in the foregoing case, and the operation done	Treated as in the foregoing case, but the case took longer on account of the sutures not holding. After 14 days, discharge practically ceased, and in four weeks only a skin wound was left, which was dressed with dry dressing and was doing well, but not quite	

No.	Animal	Condition	Operation	Treatment	Treatment Started	Animal Discharged.
			similarly. In five days the sutures burst out owing to tension on the skin. The wound was re-sutured with quill sutures, which held for another five days, then burst, and the wound was treated as an open wound. By the time the second lot of sutures gave way, the tops of the vertebral spines were covered with granulations.	healed at the time of writing.	5-12-18.	15-1-19.
13.	Brown Mare. Mule.	Punctured frog, off fore, a nail piercing the inner lateral lacuna and going upwards and backwards till its point lay under the coronet, where an abscess formed.	Cut out the puncture in the frog and also the tract of the nail from the frog to the coronet, making an opening above the coronary band; about 5 or 6 ozs. of thick pus oozing out. Then curetted the lining of the abscess cavity.	There was little or no hæmorrhage, so the wound was treated with Bipp and a pad and bandage put on, the wounds above and below being plugged with gauze, tow and cross plates keeping the dressing in contact with the frog. This dressing was left on for 4 days, and on its removal there was no discharge, the wound looking perfectly clean. The wound was then dressed at intervals of 6 days, and after three dressings was completely healed.	17-12-18.	8-1-19.

14.	Chest. Mare. Rider.	Under-run frog, off fore, and tread. As a result of the tread the frog was under-run with pus to the extent of half its length, the pus oozing from the tread.	Removed the posterior part of the frog as far forward as the sinus went, and curetted the lining of the cavity that concealed the pus.	Smeared with Bipp immediately after operation and packed up the foot with cotton wool, tow and cross plates, and left for three days. At the end of this period it was again dressed and left for four days, and on removal of this dressing the wound was healed up and covered with horn.	13–12–18.	21–12–18.
15.	Chest. Geld. Mule.	Hæmatoma of near ear, the swelling occurring on the internal aspect of the concha near its base.	Opened up the hæmatoma along the length of the ear for about two inches, cleaned out the contents and curetted the lining.	Other treatments than Bipp were first tried, but the ear got worse and suppurated. After 10 days Bipp was tried, the paste being well rubbed into the walls of the abscess cavity and the opening plugged. The discharge ceased at once, and after a second dressing at an interval of 5 days the wound was completely healed.	28–12–18.	9–1–18.
16.	Brown Mare. Mule.	Hæmatoma of ear, similar to No. 15.	Operated as in No. 15.	This case was also treated without success for 10 days by other methods; then Bipp was applied and the wound, which was larger than in the foregoing case, healed up at once. Only two dressings were applied, at an interval of 6 days.	28–12–18.	11–1–19.

B.I.P.P. TREATMENT OF WOUNDS.

By HENRY B. EVE, M.R.C.V.S.,
Folkestone.

Subject.—Valuable fox terrier, 12 months old, suffering from a large lacerated wound in the region of the neck, the result of a dog-fight. The wound had been washed with pot. permang. ere seen by me.

Treatment.—The wound was duly stitched, under cocaine, adrenalin and boric acid (hypodermic), carbolised catgut sutures being used, about a dozen, and gauze and bandage applied, also Elizabethan collar to prevent patient scratching. The sutures gave way, and I decided to treat with B.I.P.P., which healed the wound in six weeks, a scar only left. Morphia suppositories rectally.

Sequel—Toxic Symptoms.—Animal showed salivation, erythema, pruritus, and stomatitis of the mucus membrane, bordering on ulceration, purulent conjunctivitis, extreme thirst, obstinate constipation, followed by diarrhœa, and fœtid stools passed. There was a distinct blue line visible on the gums, where the teeth are implanted, similar to that seen in lead poisoning. The mouth smelt sour, and animal grated its teeth and appeared in an anæmic condition. Back arched, coat rough and staring, twitching of the muscles; pulse accelerated, artery hard, and the volume diminished, temperature elevated. The animal had a dejected appearance, appetite impaired, abdomen tucked up. The urine scanty, supply sometimes suppressed. No pain on pressure of loins, but animal whined and slept a good deal, and vomited and had colicky pains. There were no convulsions or paralysis of the hind legs.

Treatment.—Washed wound and sprayed mouth with hydrogen peroxide; gave Dinneford's magnesia in drinking water; deleted bismuth and iodoform, and only dressed wound with medicinal paraffin. Administered milk of sulphur internally in rice milk pudding. Collyrium, boric acid and rosewater.

Diet.—Glaxo, albumen (white of egg), Brand's Essence, nutrient suppositories (Emile).

Remarks.—I have used B.I.P.P. several times on horses, and always with good results, especially in broken knees, and experienced no untoward symptoms. It seems some dogs show a peculiar idiosyncrasy to its effects, which I thought might be due to an impurity in bismuth perhaps containing lead. In future I shall try pure paraffin only, so if wound is situated where dog can lick dressing, it won't matter. I wonder if B.I.P.P. causes similar symptoms in human beings The dog had a clean mouth, no tartar or sign of "oral sepsis" ere its use.

NOTES ON A HÆMATOZOA INFESTING THE MARSH TORTOISE.*

By Dr. M. L. SANI,

Chief Assistant in the Bacteriological Laboratory of the Royal Veterinary School of Turin, Italy.

At Briano, and more especially between the lagunar canals (Venezia—Aquileia) and the sea, the marsh tortoise is very common, so much so that without exaggeration one may gather hundreds of these animals in a few hours, particularly on sunny days. Our attention has been called to a hæmatozoa found in the blood of all the animals examined—about 60.

Parasites of the tortoise called *héritrocytogregarines* have already

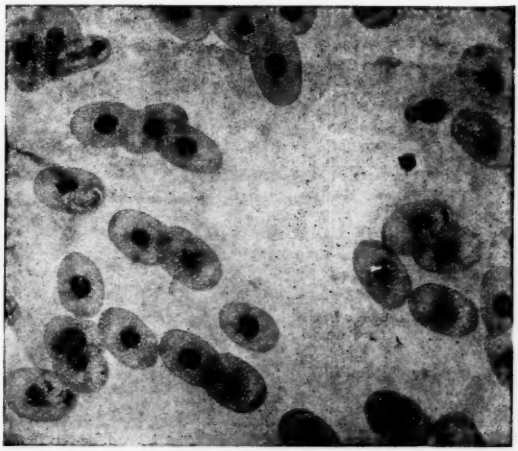

Fig. 1.

been described and studied by Laveran and Menil, Labbe, Borner, Schœpff, Sergent, Papovici, Ducloux, Castellani, and Willey, Schweigg, Danile, Wsky, Luke, Gray, etc.

Those tortoises in which we have found hæmatozoa as a rule show no morbid symptoms, and the infested animals do not seem to suffer at all from the presence of the hæmatozoa, although present in large numbers.

In most of these tortoises the hæmatozoa are very numerous, and one frequently finds in a very thin preparation of blood examined with a magnifying glass 4 and the object 1/12 eight or nine in the same field. In fact, in Fig. 1, where $\frac{3}{4}$ of a slide is represented, one may

* Translated by Capt. Somers, R.A.V.C.

count five héritrocytogregarines. It is difficult to come across part of a preparation where there are not at least two parasites on the slide. One often finds two kinds of parasite in the same blood-smear (hématie), which, meanwhile, does not suffer profound alterations. In such case the nucleus generally remains oval in shape, and often displaced at the periphery of the smear.

The smears infested by the large héritrocytogregarines are generally increased in size, the nucleus being clearly pushed back, while the protoplasm is often less coloured than normally. Desiccated blood fixed in the alcohol-heater has been coloured by the solution " Tipo Giemsa," prepared at Turin by Dr. Barbano, and by the blue polychrome of Unno (of the firm of Cogit, Paris), éosin orange.

FIG. 2.

By means of these processes we have always obtained very typical preparations, especially taking into consideration that the parasite is composed of a protoplasmic body difficult to influence by colouring matter, on account of its capsule.

In Figs. 2, 3, 4, 5 one clearly distinguishes the clear space beyond the parasite up to the limit of the protoplasm, and one clearly sees a darker border, which probably represents a cystic membrane.

Most of the héritrocytogregarines appear in the shape of a small French bean, measuring from 10 m. to 14 m. in length by 3 to 5 m. (Fig. 3); other smaller ones (Fig. 5) have an oval shape and always regular edges. The large héritrocytogregarines (Figs. 4, 6, 7) have a very elongated form, with rounded extremities, but with one side larger than the other, like a banana; these forms measure 18 to 20 m. by 4 to 6 m. One often meets with parasites which completely fill

FIG. 3.

FIG. 4.

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FIG. 5.

the cell enveloping them, till one finds them reduced to a sort of shell in which one sees the nucleus crowded to the edges, flat and closely adhering to the parasite.

Again, one meets with parasites nearly twice as long as their enveloping cell, which they fill completely.

Towards the middle of the body of the héritrocytogregarines one generally sees a rounded or oval karyosome, and in that case the long axis of the karyosome is parallel to that of the parasite.

We have always observed that the long axis of the body of the héritrocytogregarine is parallel to that of the hématie.

FIG. 6.

The protoplasm of the parasite shows more or less fine granulations.

In the large forms of the parasite one clearly sees that the karyosome is constituted by an agglomeration of granulation of chromatine.

The blood-smears infested by these large forms are, as a rule, increased in volume, and certainly more shapeless.

We have found a very few free parasites (hæmogregarines), which do not differ from the héritrocytogregarines which we have described, only their protoplasm does not readily assimilate colouring matter.

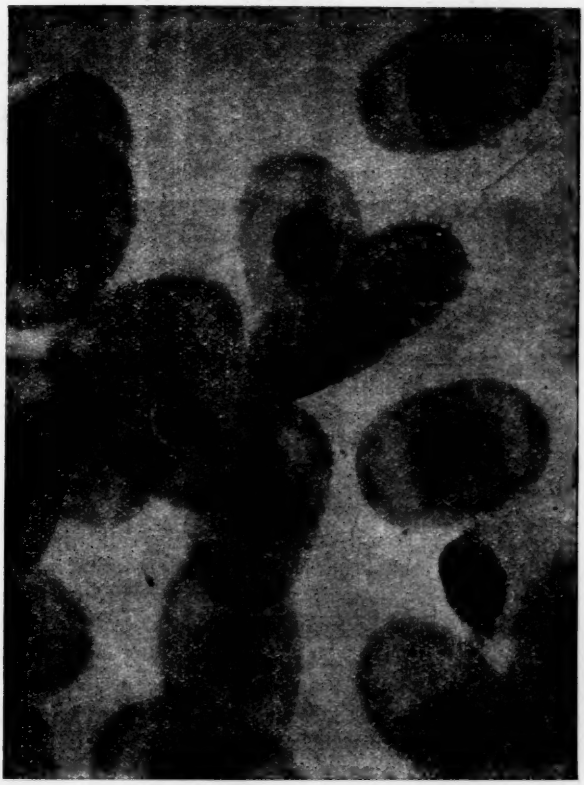

FIG. 7.

We have come across hæmogregarines in the friction of the organs, where we have also seen the héritrocytogregarines.

We have not seen any form of multiplication, despite the many researches made from specimens of peripheral blood, and by smears made from the viscera of infected animals.

Conclusions.

The héritrocytogregarines and the hæmogregarines infest 100 per cent. of the marsh tortoises found in the bogs of Briano (Venezia). The parasites do not seem to give any appreciable clinical trouble to their hosts, so that the state of the blood of the animals we have examined may be considered as the normal condition of the blood of our marsh tortoises.

The blood-smear parasites are not subject to important changes, except that they seem slightly increased in volume.

If the co-existence of héritrocytogregarines and hæmogregarines and of trypanosomes in the blood of certain tortoises has led others to assume a relation between these parasites, our researches permit us to pass over this hypothesis, as we have never seen in any of the animals thoroughly infested with hæmogregarines and héritrocytogregarines any trypanosomes or intermediary forms.

We still believe that in the non-pathogenic hæmatozoa the period of multiplication of the parasite is limited to a certain number of days at the beginning of the infection, whilst in the more advanced periods one finds none in the blood and the organs, but only the adult forms, without any appearance of multiplication.

THE SUBCUTANEOUS INJECTION OF TALLIANINE IN CASES OF RESPIRATORY DISEASE.

By Captain J. F. D. TUTT, M.R.C.V.S., F.R.M.S.,
Winchester.

In placing this on record, of cases treated by Tallianine, it is not the intention to claim that it is a specific, but to show that from experience with other agents the writer has been forced to conclude that it is by far the best remedy we have for subcutaneous medication at present, and that its use is more often than not accompanied by gratifying results.

To possess an agent that has marked effects when injected sub cutaneously, in cases of this disease, is important and of inestimable value, as it is now generally recognised that to administer medicine per os is very risky, and in many cases, in the primary stages, impossible.

Tallianine (Terpene Ozone) is a product prepared in France by Brigounet père et fils and Gaubert, and is obtained by the action of ozone upon a terpene, bearing volatile oil, the process being stopped at a point when the resulting product is capable of evolving four times its own volume of ozone.

It can be given intravenously (jugular), intra-tracheal, or subcutaneously. The writer always uses the latter method, as it is just as effectual, and is the easiest.

Characteristics.—A colourless liquid; should bubble when exposed to the air, unless the liquid in the ampoule in which the production is dispensed "fizzes." When the end of the ampoule is broken off it has been found *not* to have the usual marked action. The writer therefore considers, rightly or wrongly, that the absence of this phenomenon indicates loss of potency.

Action.—Leucocytosis is induced at once. It acts in the blood by "revivification" of the red corpuscles, giving venous blood the properties of arterial blood, re-establishing hæmatosis in diseased lung tissue, and producing asepsis of the blood in the heart and lungs. Its two essential properties are, therefore, hæmato-asepsis and anti thermis.

Dose.—10–20 c.c., repeated once or twice a day, depending of course, on the case.

The following table of results obtained by MM. Grenot and Brunet, veterinary surgeons, of Paris, in cases of infectious pneumonia is instructive.

	Standard Treatment.	*Tallianine Treatment.*
Number of horses treated	38	39
Days of treatment	246	205
„ „ convalescence	509	255
Deaths	7	2
Average days of treatment per horse .	7·93	5·25
Average days of convalescence per horse	16·40	6·79
Death rate	18·42 %	5·12%

The following are selected as a few typical cases of respiratory disease treated by the writer from November, 1914, to January, 1916, and since January last :—

CASE I.

Subject.—Brown cart mare.

Age.—7.

Condition.—Good.

History.—At first a mild attack of catarrh. This suddenly developed into pneumonia.

1914.

Dec. 31. Respirations hurried and laboured. Temperature 105·4. Tallianine, 10 c.c., injected.

1915.

Jan. 1. Respirations easier. Temperature, 104 deg. Tallianine, 10 c.c., injected at 9.30 a.m. Reported again at 5 p.m. Temperature in evening, 103 deg.

,, 2. Respirations practically normal. Temperature, 103·4 deg. Tallianine, 10 c.c.

,, 3. Respirations normal. Temperature, 102 deg. Tallianine, 10 c.c.

,, 4. Respirations slightly increased. Temperature, 103·6 deg. Tallianine, 10 c.c., d.p.d.

,, 5. Respiration normal. Temperature, 102 deg.

,, 6. ,, ,, ,, 102 ,,

,, 7. ,, ,, ,, 101·6 ,,

,, 8. ,, ,, ,, 101 ,,

,, 9. ,, ,, ,, 100·4 ,,

,, 10. ,, ,, ,, 100·4 ,,

,, 11. ,, ,, ,, 100·2 ,,

,, 12–31. Convalescent. Tonics.

Feb. 1. Returned to work.

Remarks.—An alteration in the respirations was observable within twenty minutes after the first injection, on December 31, of Tallianine. This appears to be the first and most marked action. The second is the fall in temperature.

CASE II.

Subject.—Bay gelding.

Disease.—Congestion of the lungs.

History.—Previous history of emphysema of long standing. Was driven hard all day by an inexperienced person, with the result that it arrived home exhausted, blowing, and with a bloody discharge from both nostrils.

1915.

April 2. Respirations laboured and hurried. Sweating. Pulse almost imperceptible. Bloody discharge from both nostrils. Tallianine, 20 c c., injected. Temperature. 106 deg.

,, 3. Respiration easier. Temperature, 103·4 deg. Tallianine, 10 c.c.

,, 4. *Respirations normal. Temperature, 102 deg.

,, 5. * ,, ,, ,, 103·2 ,,

,, 6. * ,, ,, ,, 102·4 ,,

,, 7 ,, ,, ,, 101·8 ,,

,, 8 ,, ,, ,, 100.4 ,,

* Tallianine, 10 c.c.

Result.—Returned to work after fourteen days' rest. This case is interesting, as the animal was 20 years of age, in poor condition, and with chronic emphysema.

A similar case is under treatment at the time of writing, and is progressing satisfactorily.

In conjunction with this treatment Liquor Ammon. Ant. Com. in ℥ss-℥i doses every four hours in the drinking water has been given, or in a *cold* mash. I regard this agent as the finest medicinal agent we possess for all cases of respiratory disease.

Remarks.—The condition at the onset in the vast majority of cases was such that the internal administration of drugs per os was impracticable, it being out of the question to drench; and I think that the finally accepted view now is that it is advisable not to drench cases of this disease. Water and food were often refused, in some cases for three to four days, so the only way to give medicinal remedies was subcutaneously. I therefore ascribe the good results to Tallianine, as in only a few cases did the ammonia compound play any part in the early stages.

TABLE OF RESULTS OBTAINED.

Disease.	*Days of Treatment.*	*Convalescence.*	*Result.*
Pneumonia	14	26	Cured.
,, ...	9	—	Died.
,, ...	21	16	Cured.
,, ...	3	—	Died.
,, ...	1	—	Died.
,, ...	7	17	Cured.
Congestion of the lungs .	16	16	Cured.
,, ,, ,, ,,	4	7	Cured.
Pneumonia	9	—	Died.
,, ...	5	—	Died.
,, ...	5	9	Cured.
,, ...	8	14	Cured.
,, ...	13	10	Cured.
,, ...	22	25	Cured.
,, ...	7	14	Cured.
,, ...	12	17	Cured.
,, ...	12	17	Cured.
,, ...	17	21	Cured.
,, ...	17	20	Cured.
,, ...	5	13	Cured.
,, ...	1	—	Died.
Congestion of the lungs .	3	11	Cured.

Disease.	*Days of Treatment.*	*Convalescence.*	*Result.*
Pneumonia	14	21	Cured.
„	16	21	Cured.
„	8*	—	Died.
„	4	—	Died.
„	7	14	Cured.
„	15	24	Cured.
„	12	21	Cured.
„	10	14	Cured.
„	5	—	Died.
„	2	—	Died.
„	10	14	Cured.
„	7	11	Cured.
„	3	—	Died.
„	6	—	Died.
„	1	—	Died.
„	14	26	Cured.
„	10	14	Cured.
„	12	14	Cured.
„	7	14	Cured.
„	5	—	Died.
Total....	42. Cured....	27. Died....	15.

* In-foal mare ; slipped foal, and died within five hours.

Conclusions.

1. That Tallianine, if used early and repeated at intervals, has a marked effect in cases of respiratory disease, and is the best remedy so far discovered for subcutaneous medication.

2. Its action is rapid—an alteration in respiration has been observed within ten minutes of inoculation, and usually within thirty minutes in every case.

3. It can be used when the administration of medicines per os is impracticable.

4. It should " bubble " on exposure to the air. In some supplies this was not observed, and in these cases there was little or no benefit from its use.

5. It can be used for smaller animals, such as the dog, in doses of 3–5 c.c. in cases of the respiratory form of distemper, and has given good results.

General Articles.

SUGGESTIONS FOR THE REORGANISATION OF THE VETERINARY CURRICULUM.

By Capt. T. J. FAITHFUL, M.R.C.V.S., R.A.V.C. (S.R.)

The present seems to me an entirely satisfactory time to consider the whole question of Veterinary Education. It will probably be at least two years before any alterations can take place, and by that time the flow of students should be normal. The recent Education Act, together with other influences which have been at work for some time, is likely to profoundly alter secondary education, and the curriculum of our veterinary schools should be altered so as to fit in with the new state of things.

Before putting down what may, I hope, prove a basis for discussion, I wish to make it quite clear that I am not one of those who advocate a five years' course for the veterinary diploma. I believe that our confrères in the medical profession were ill-advised when they extended the course for the normal qualification. Much work in subsidiary branches of medical practice has been lost to the profession which might have been retained if, instead of extension, they had gone in for rearrangement of studies and increased facilities for postgraduate work.

For this reason we should carefully consider the effect of extension on our work. I hold that four years at a veterinary school should bring a student (male or female) to that stage where, if he intends to go into practice, he would be able to act intelligently as an assistant while learning to apply his theoretical knowledge; or to where, in an Army School, School of Tropical Medicine, School of Veterinary Sanitation Science, etc., he could commence his specialised studies.

Elementary Education.

Many secondary schools now teach elementary chemistry, botany, and zoology. Further, the evolutionary theory has so entered into the substance of thought that all subjects are being taught in relation to it. There should, therefore, be no need for a veterinary student to study these subjects in an elementary manner at veterinary schools, or to spend part of his first year learning to think in terms of development.

I hope that it will not be long before a leaving certificate will be granted to students of a certain standard when leaving their secondary school, which certificate, if standardised by the Board of Education, should be accepted by the R.C.V.S. as evidence of a satisfactory preliminary education on the part of proposed students.

The age at which a student should be accepted for his first veter-

inary examination should, I think, be raised, and satisfactory evidence should be produced that the student has received instruction in English, mathematics, elementary botany and zoology, chemistry, physics, Latin and two modern languages. It may be suggested that raising the age at which a student may commence studies and requiring from him a wider preliminary education is tantamount to extending the qualification course, but this is not the case. The expense of study at a High School, Grammar School, or other secondary school in the neighbourhood of the boy's own home is not nearly so expensive as keeping him at one of the few centres where the specialised education can be obtained. Of course another year at one of the favourite public schools would probably be as expensive, but with good teaching fairly close at hand in every county there will not be the same keenness as there has been in the past to send children half way across England to some special school.

If this arrangement of preliminary studies was adopted, it might be necessary for a year or two for the R.C.V.S. to hold a preliminary examination in biology, chemistry, and physics for proposed students who had not taken one or all these subjects at their secondary school, but the candidate should be allowed to obtain the necessary instruction wherever he might wish.

The Veterinary Course.

It must not be thought, because I would relegate elementary zoology and chemistry to the secondary education period, that I would wish to see these departments abolished from our veterinary schools: far from it. I want to see both these departments more fully utilised than they have been in the past. The physics laboratory at those schools which possess one might well be done away with, making room, perhaps, for a physiological laboratory, where experiments in dietetics and other subjects could be carried on by comparative physiologists.

First Year's Study.

The veterinary student arriving at his college with a good grounding in some of the subjects now taken in his first year, should take comparative anatomy as his chief subject, but I advocate the postponement of the examination to the end of the second year. This would enable the teachers to adopt a more rational method of instruction than the present system of examination allows. In the first year I would also require the student to continue his study of zoology by attending theoretical and practical courses of instruction in protozoology, helminthology, and entomology. Instruction in these subjects sh ould pave the way for the study of medical protozoology, parasitology, and preventive medicine of the third and fourth years, and bring the student into intimate relation with his microscope, a close

companionship which should be continued until the end of his professional life.

The last subject I would place in the curriculum for the first year is stable management, including the handling of animals. The subject cannot be commenced too early; further, it is an open-air subject, and gives the student a much needed relief from the laboratory and lecture hall.

SECOND YEAR.

In the second year, as at present, the study of comparative anatomy should be continued. Comparative physiology and histology should, of course, also be given the important position they now hold. The third subject might, I think, be called veterinary hygiene, Part I., which should include dietetics and the study of poisonous plants, nor can I overemphasise the importance of there being close co-operation between the professors of physiology and dietetics

THIRD YEAR.

Here, again, the position of pathology and bacteriology should remain as at present, but the laboratory work should be spread over a larger part of the year. The second subject might be Veterinary Hygiene, Part II., including meat inspection, the chemistry of water and food analysis, and veterinary toxicology, the third subject being materia medica and pharmacology, which should be taught as a natural sequel to the study of physiology and dietetics.

FOURTH YEAR.

In the final year attention should, as at present, be mainly concentrated on medicine and surgery, but with better arranged teaching in the earlier years there should be little or no cramming.

The third subject should be Veterinary State Medicine, being an outline of the veterinary work of the Board of Agriculture and the Ministry of Health.

With regard to examinations, I would advocate allowing the man who failed only in the third subject at the end of his second or third year to proceed with his normal course of study, provided, of course, that he must have passed in that subject before sitting for his third or fourth examination as the case might be.

In putting before the profession these brief suggestions for educational reform, I would express the hope that they may prove a basis for discussion, and that the R.C.V.S. will shortly appoint a committee to consider the whole question. I have suggested close co-operation between the professors of physiology and dietetics; but, as is now being realised in regard to general education, very close co-operation

should exist between *all* teachers; no branch of knowledge should be taught as a separate subject, but in relation to the whole body of knowledge with which it is desired to equip and stimulate the intelligence of the student.

University Degrees.

In discussing Veterinary Education it is not possible to leave out the question of University degrees. I think it would be well if those desirous of taking a degree as well as a diploma should be encouraged to take their preliminary scientific examination before entering on the course for the diploma. I am all in favour of bringing the Veterinary Colleges in ever closer touch with the Universities, and I hope in time to see a Veterinary School attached to Cambridge, if not at both Oxford and Cambridge. I feel convinced that with a more scientifically arranged curriculum a veterinary education would come to be the natural course of study for students intending to devote themselves to the life study of zoology, comparative anatomy, and comparative physiology.

Where I have used the word "student" I mean it to include men and women, because, though women cannot at present hold the diploma of the R.C.V.S., I believe it will be all to the interest of veterinary science if the bar is removed at the earliest opportunity.

Proposed Curriculum Tabulated.

First Year.—Comparative Anatomy.
Zoology:
Protozoology.
Entomology.
Helminthology.
Stable management.

Second Year.—Comparative Anatomy.
Comparative Physiology.
Histology.
Veterinary Hygiene—Part I.

Third Year.—Pathology.
Bacteriology.
Veterinary Hygiene—Part II.
Chemical Analysis.
Meat Inspection.
Materia Medica and Pharmacology.

Fourth Year.—Medicine.
Surgery.
State Veterinary Medicine.

CONTAGIOUS ABORTION QUESTIONS ANSWERED.*

By Dr. F. B. HADLEY.

To produce the millions of quarts of milk that have put Wisconsin in the lead as the greatest dairy State, an immense number of cattle are kept on her farms. Of all the diseases to which these cattle are subject, the abortion disease is by far the most common and important. This circular has been written to answer the many questions that owners of affected animals ask.

Although there are some vital questions about this disease that remain unanswered, it is highly desirable that the facts which are known be available for the information of interested persons, as it is only through an understanding of the nature of the malady that it can ever be brought under control. Our lack of knowledge about certain phases of the abortion disease has made it necessary to answer some questions incompletely. Later it is hoped that experiments now under way may shed light upon these obscure conditions.

Nature, Extent, and Cause.

What does the term "contagious abortion" mean? The term "contagious abortion" is misleading and not sufficiently comprehensive to warrant its use in connection with the disease to which it is popularly applied. To illustrate—it conveys the impression that the fœtus must be expelled before it is mature, which is not true. Moreover, it does not even imply that many other grave changes may occur as a result of abortion infection. Therefore, it is desirable to use the more extensive term "abortion disease." The only justification for employing the term "contagious abortion" in the title is because it has been in use so long that most livestock men know the disease only by this name.

What does the term "abortion disease" mean? The term "abortion disease" is applied to an affection of cattle that is produced as a result of the invasion of the body by a certain germ, that can be transmitted to other animals, that affects several animals in many herds, and that runs a course of weeks or even months. Scientifically it is known as an infectious, communicable disease of cattle, chronic and insidious in nature, that confines itself largely to the organs of reproduction.

By what other names is the abortion disease known? Besides contagious abortion, this affection is known as infectious abortion and epizootic abortion. Some farmers refer to it as slinking or slipping the calf; others as premature birth of the calf.

* Wisconsin Bulletin 296; Agricultural Experiment Station of the University of Wisconsin.

What is known about the prevalence of the disease ? The abortion disease is the most widespread of all diseases to which cattle are subject. The majority of pure bred dairy herds are known to be infected,while it has also been reported in many beef herds. It is found in many recently settled communities and on open ranges through having been introduced with breeding stock. Although it is true that the abortion disease may disappear as suddenly from a herd as it appeared, there is a far greater probability that it will smoulder in the herd for years, occasionally breaking forth, until often more than 50 per cent. of all the cows have aborted and 75 per cent. have become infected.

What losses result from the abortion disease ? The calf is either born dead or is so weakened that it soon dies. Often there is a reduction in the milk flow of the cow for nearly a year. Frequently the afterbirth is retained and pus accumulates in the womb, which may result in either acute generalised infection (blood poisoning) or chronic catarrh of the uterus with subsequent sterility. The latter condition reduces the value of the affected cow, and even if conception does take place there is a likelihood that abortion will recur a second or even a third time. The secondary troubles just mentioned cause greater losses and are more difficult to control.

What is the approximate yearly loss from the abortion disease in Wisconsin ? It is estimated that about 8 per cent. of all milch cows abort each year. Assuming that the loss is $25 a head, which certainly seems to be a reasonable estimate, considering the high prices of feed and milk, the total loss for Wisconsin can be computed if the number of cows is known. The census reports for 1917 give the cow population of Wisconsin as 1,785,000 head. On this basis the annual loss would be about $3,570,000. This figure represents in a measure the stupendous toll levied by the abortion disease and its great economic importance to Wisconsin's farmers. It is apparent that the loss per cow to owners of pure bred animals is much more than to those who own grade and common cattle.

What is the cause of contagious abortion ? A micro-organism or minute germ (the abortion bacillus of Bang) is known to be the sole cause of contagious abortion. A very powerful microscope is needed to see the organism on account of its extremely small size. It should be understood that other germs may invade the tissues after the abortion organisms have caused damage. These organisms are the ones often responsible for sterility and the other complicating diseases.

On what does the abortion germ thrive best ? Fœtal tissues and milk are best suited for the growth of the abortion bacillus. It can also live for some time in the womb and womb discharges after abortion has occurred. From the fact that its natural foods are produced

in the womb and udder, it follows that these organs would most frequently become infected and act as the abode of the germ.

Can the abortion germ grow outside the body? Although it is difficult to get the germ of abortion to grow on artificial culture media when first isolated, after a few generations it can be propagated without difficulty in the laboratory. (See section entitled "Means of Diagnosis.")

How long do abortion germs live outside the body? Without knowing the conditions under which the germs are situated, a definite answer cannot be made to this question. Under experimental conditions the germs soon die upon direct exposure to sunlight. In moist places they may live for weeks or months. We have isolated the germ from a fœtal calf that had been solidly frozen for 24 hours, so freezing for this length of time does not kill this organism. Bang and Stribolt were able to isolate the abortion bacillus in pure culture from two fœtuses that had been dead five and nine months respectively. The uterine discharge kept on ice contained living organisms after seven months. Therefore it is evident that the germ may live for long periods outside the body, but it does not increase in numbers under such conditions.

Does abortion occur in cattle from other causes than infection with these germs? Practically all abortions are due to contagion, and the sooner the cattle owner realises this, the sooner will he be able to prevent further losses. However, a continuous high fever from any cause may produce abortion. Injuries or defects that damage the womb or fœtal membranes or in any way disturb the nutrition of the fœtus may also cause cows to abort. It is extremely doubtful whether slipping, goring, kicks, falls, and similar accidents ever cause abortion, the opinion of many dairymen to the contrary notwithstanding.

Are certain feeds capable of producing abortion? It is known that a ration composed of wheat and other products of the wheat plant reduces the resistive power of the cow to diseases, and often causes her to calve prematurely. Experiments conducted at the Wisconsin Agricultural Experiment Station point to a lack of sufficient mineral matter in the wheat ration as one disturbing factor and to some poisonous material, as yet of unknown character, as another. Corn, on the other hand, contains all the elements necessary for successful growth and reproduction. There is little reliable evidence to support the common belief that mouldy, spoiled, and smutty grain or roughage is capable of producing abortion. Practically every attempt to produce abortion by feeding pregnant cows with such feeds has failed.

Does contagious abortion ever occur in other species of farm animals? Reports of serious outbreaks of abortion in mares, sows, and ewes are on record. However, a specific germ for each animal species has been found responsible for the abortions. In other words, contagious abortion of cattle is not transmissible to horses, swine or sheep, or the forms affecting these animals to cattle under natural conditions. We have produced abortion experimentally in ewes by injecting large doses of the germ that causes the disease in cattle. Under ordinary farm conditions there is no evidence to show that ewes or other species of farm animals ever abort as a result of infection with the germs that cause cattle abortion.

Acquirement of Natural Infection.

Is the abortion disease ever inherited? We have demonstrated the presence of abortion germs in the stomach contents of prematurely born calves, but their dams also were always found to be infected. These calves probably acquired the infection through having swallowed placental fluid containing the abortion germs. This does not constitute inheritance in the biologic meaning of the term. The blood tests that will be described later show that an infected cow always gives birth to an infected calf. When the cow is not infected the calf fails to react to the blood tests at birth.

How do the germs of abortion gain entrance to the body? The abortion organisms may enter the body by any one of the following paths: the digestive tract, with the food or drink; the genital tract, during sexual intercourse or by contaminated objects and fluids introduced either intentionally or accidentally; the broken skin, as a cut or wound; the udder, either by penetration from the inside or introduction through the teat canal.

Does age make any difference in liability to abortion? Heifers are undoubtedly more apt to become infected than are calves or cows. A careful study of diseased herds has shown that more than 80 per cent. of the cases acquire the infection before the second calving. The most favourable time for infection to gain entrance seems to be shortly after the heifer has dropped her first calf, and when the mouth of the womb is still open. Many heifers must become infected earlier, else they would not abort their first calf.

Why are heifers more frequently affected than older cows? Apparently the heifer has less resistance to the abortion germs than the cow, which seems to develop more or less protection against these germs. (See section entitled "Development of Immunity.")

What percentage of heifers abort? Although heifers acquire the abortion disease and abort more frequently than do cows, heifers in

different herds show a great difference in their ability to withstand the effects of the disease. If the disease has established a firm footholds and no steps are taken to control it, a large percentage of the heifers is likely to abort. In one very large herd of which careful records were kept over a period of three years, 1,238 heifers conceived. Of these 195, or 16 per cent., were known to have aborted.

When do cows become infected? If abortion occurs early in the gestation period infection must have taken place near the time of breeding. In cases where the fœtus is carried seven months or longer, it is highly probable that infection occurred some time after conception. The statement has been made by one investigator that once the uterine seal, which forms shortly after conception, is perfected, there is no danger of infection occurring, and the cow will carry the fœtus to term. At present we are not at all certain that this is true.

At what age may calves become infected? Calves may acquire the disease before as well as after birth. In our experimental work we have found that the new born calf of an infected cow usually reacts to the blood tests in the same way as the dam, so it must have become infected before it was born. That the fœtal calf swallows the fluid surrounding it is shown by finding its hairs and the germs in the stomach When calves are fed from birth on raw milk containing the abortion germs they seldom react to the blood tests. This would indicate that the calf is not easily infected by way of the digestive tract.

(*To be continued.*)

Translations and Abstracts.

ON THE MOVEMENT OF THE SPERMATOZOA OF THE DOMESTICATED ANIMALS.

INAUGURAL DISSERTATION, ZURICH, 1918.

By Veterinary Surgeon WALTER DÄTWYLER.

[Questions of zootechny are so little discussed and investigated among animals in this country that the following translation should be interesting.—*Translator.*]

The individual movement of the male genital cells is justly considered of great significance in bringing about conception. If the approach of these cells to the ovum is not wholly ascribable to this factor, but, perhaps, as a chief cause—quite unnoticeable directly—to muscular activity of the female genital apparatus during and after copulation, yet the last step in the approach of both genital cells is due to the tail of the spermatozoa.

Dätwyler examines the mechanism of the movement of these cells generally from a theoretical and physico-chemical standpoint, and makes observations on chemotaxis and rheotaxis. The chief part of his work is principally taken up with an examination of the significance of external conditions, from which the spermatozoa can naturally be so little emancipated whether as cells or in mode of life. The investigations are not only interesting to the physiologist, but are important to the practitioner, for problems of fruitfulness or unfruitfulness are in part naturally problems of spermatozoa movement.

The movement of the spermatozoa is brought about by the movement of the tail, which alternately curves and stretches, the stretching taking place quicker than the curving, whereby a movement forwards is effected. Thus the cells turn round on their long axis. The movement is not in a straight line, but a spiral one. It seemed almost as if in some spermatozoa the tailpiece was furnished with an embedded spiral spring. The bending of the tail can be traced back to the contractility of the tail substance, elasticity (combined with one of the other factors), changes of surface tension, or a combination of these factors. Here it may be noticed that the comprehension of biologic contractility must naturally be analysed physico-chemically. The author takes up the view that all the ends of life may be traced to known chemical and physical laws, and that the removal of the problem into the mystic *noli-me-tangere* region of "biologics" or "vitals" confines biology to a purely descriptive science, in which the highest teleologic considerations have place.

Chemotaxis, which in immature spermatozoa is not yet clearly established, is absolutely necessary for the final meeting of both genital cells. It has to show the spermatozoa the way, so that they, by their own movement, can reach the ovum. Temperature has an influence on the intensity of movements and on the continuance of motility, as the movements at 37 deg. C. are livelier than at summer temperature, but motility continues longer in low than in high temperatures. Whilst spermatozoa in freedom in a bull's testicles continued moving for 11 days at −10 deg. and +3 deg. C., their motility at 37 deg. only continued about 28 hours and at 58 deg. for nine minutes, and at 56 deg. death in a moment.

It is believed that the spermatozoa cells have a metabolic assimilation which disappears quickly at a high temperature, and thus early leads to the exhaustion of the disintegrated material. Of special interest is the effect of viscosity of the medium on the motility of spermatozoa. It was shown that the greater the viscosity of the medium the shorter the distance traversed in a unit of time. For example, spermatozoa cells in a 35 per cent. gum arabic solution, with a viscosity

of about 77 (water = 1), were still in a position to make tail movements, but they could not progress from the place. The constraining effect of triturated stuff added to the medium is not proportional to its viscosity, but it is stronger at first and thereafter weaker, yet the first small quantities of a viscous addition to the medium have a considerable restraining influence on the disappearance of strong movements. On this account the conditions for strong movement in the female genital apparatus, taking into consideration the rather viscous, slimy medium, are rather unfavourable. On the one hand, it may be noticed at periods of heat the viscosity of the cervical mucus in cattle diminishes, and, on the other hand, producing a condition of the medium which preserves the continuance of the motility of the spermatozoa. This makes clear the reason why the spermatozoa, in spite of a relatively high temperature in the female genital organs, retain their fructifying activity for quite a long time. On this point fresh observations are still to be made.

A great number of experiments have been conducted with a view to ascertaining the rôle of third substances in the medium. It has been ascertained that the motility of the spermatozoa is very largely dependent on the composition and properties of the medium, and that changes of this, without at the same time influencing the movement of the spermatozoa, are hardly possible. Most salt solutions preserve the motility of spermatozoa a little less than Ringer solution, which is a mixture of blood salts in physiological concentration. Sodium, potassium, magnesium, and calcium influence motility best, whilst lithium and ammonium are poisonous. A restraining influence in ascending order is exercised by sulphates, bromine, chlorine, iodine nitrates, cyanides, sulpho-cyanides, and fluorine, the last members of the list being poisonous. Thus the fluoride and rhodanide of lithium and ammonium are the deadliest poison, whilst sulphate, chloride and bromide of sodium, magnesium and calcium are favourable media for the spermatozoa. The latter must be in low concentration in solution. For sodium chloride, for example, the most favourable concentration is about 0·9 per cent. Of special significance for motility is the alkalescence of the medium. The experiments of the author make it probable that the alkalescence exerts its optimum effect in a certain low degree of solution, for here motility continues longer than in certain large or small concentrations of the hydroxyls. It does not depend merely on the alkaline reaction, but on a certain strength of the reaction. In a similar way it is affected by acidity. Here we may note the reaction of different media with which the spermatozoa naturally come in contact. The following have alkaline reactions:— Epididymal secretions in man and the dog; prostatic secretion in

cattle, and, according to some authors, also in man; seminal vesicle and Cowper's gland secretion in man; the ejaculates in man and cattle; vaginal secretion in mare, cow, and bitch; cervix and uterus in woman, cow and bitch. Acid reactions occur in the epidydimal secretion of cattle, prostatic secretion in cow and dog, seminal vesicle in cattle, vagina in woman.

Further investigations are being made on the effect of certain organic chemical mixtures and disinfectants on the genital cells. These show that our most useful disinfectants are creolin, lysol, liquor alumni acetici, formaldehyde, pyoktanin, and in the usual concentrations these are strong spermatozoa poisons. Vaginal or uterine injections before copulation are not indicated.

On the fate of the spermatozoa in the female genital tract we know little certain. The conditions in different species of animals seem to differ greatly. Whilst in man there is a very long continuance of sojourning, in the horse the spermatozoa die very soon after coitus. In general it is unknown what influence the mixture of the ejaculate with the secretion of the vagina and uterus exercises on the spermatozoa. The experiments of Dätwyler with cattle spermatozoa show that these secretions alone cannot be used as favourable media for the spermatozoa. Whilst the great viscosity of the vaginal and uterine secretions is deleterious to movement, it effects a favourable influence on the preservation of the power of movement. Fruitfulness in all animals takes place in the oviducts. The small individual power of movement that the spermatozoa have, at least in the large animals, makes it very improbable that in the time between coitus and arrival in the oviducts they could travel the great distance by their own power. One must believe that the movement of the female genital apparatus in coitus exercises a great influence on the movement. As to the rapidity of movement of spermatozoa, various authors give 17 to 100 microns per second, a maximum of 6 millimetres a minute, or 360 millimetres an hour. As the viscosity of the medium is not given, these figures have little value. According to the experiments of the author, in Ringer solution, whose viscosity corresponds to about that of water in 37 deg., 144 microns per second; in a gum arabic solution, with a viscosity corresponding to that of blood, only about 58 microns per second. In a slimy medium progress is naturally still less.

According to these experiments, it is clear that the possibility of fruitfulness is greater after manual opening of the cervix than if the spermatozoa depend for disposal only on the mucus-filled capillary canal of the cervix.—*Swiss Veterinary Journal.* G. M.

PARALYSIS OF THE RUMEN (ACUTE FLATULENCE) IN CATTLE.—By Delmer.

Frequently observed in sheep and cattle, more rarely in the goat, this malady may be rapidly followed by death if one does not act quickly and deal with it.

Etiology.—Among the factors causing it one distinguishes (*a*) predisposing, (*b*) determining. It is possible to bring it about experimentally by section of the pneumogastric nerve, which destroys the motility of the rumen. Also all influences capable of provoking paresis or paralysis of the rumen are considered as *predisposing causes*—low external temperature acting reflexly; over-feeding; general fatigue; rapid and strong distension of the walls of the rumen; absorption of toxic substances elaborated by some plants, such as ranunculacæ, poppies, hemlock, belladonna, tobacco, etc.; ingestion of too cold or frosted food, or even dew-besodden forage.

The *determining causes* will be found in fermentations which operate in the cavity of the rumen after the ingestion of certain food plants, such as young shoots of lucerne, clover, and sainfoin.

Symptoms.—From the clinical point of view, acute meteorism is chiefly denoted by an extreme distension of the walls of the rumen, due to accumulation of gas in its interior; there results a protrusion of the diaphragm forward, and a more or less strong compression on the organs of the thoracic cavity, which, as a result, hinders the action of the lungs. If one does not act promptly, this state can bring about death of the animal in a short time from asphyxia and also absorption of a part of the gas.

Pathogenesis.—Classic authors agree in attributing to fermentations the origin of the gas which causes acute flatulence, but they are dumb on the nature of these ferments and the specific agents which provoke them.

In April, 1913, and May, 1914, M. Delmer made observations on two cases of hoven, and sought to throw light on certain relative points concerning their etiology and pathology, and to deduce therefrom a rational therapy.

Analysis of gases and liquids.—The gaseous mixture which distends the rumen, collected by puncture and confined, consisted in variable proportions of carbonic acid, methane, hydrogen, azote, oxygen, and sulphuretted hydrogen. Carbonic acid always predominates; hydrogen and its carbide comes next; the other gases are much less in proportion, sometimes only traces of them.

In the liquid substances one can discern numerous organic acids, among which butyric acid figures often in quite a large quantity.

Bacteriological analysis.—Bacteriological examination of the con-

tents of the rumen reveals the existence of a very variable flora, in which the *bacillus amylobacter* is by far the predominant agent. "This polymorphous saprophyte presents itself in the form of a more or less long rectilinear or slightly curved rod ; when it is in process of sporulation it takes on an ovoid, elongated, swollen in the central part, or bell tongue form—according to the position occupied by the spore. It is easily stained by all aniline dyes and takes Gram. One can discern the presence of spores by special staining processes, a very important fact for the diagnosis of this bacterium ; when it has been treated by the decolourising fluid one can see in the body of the rod little blue grains corresponding to grains of starch.

These facts allow of the interpretation of the mechanism of the production of acute flatulence. The *b. amylobacter*, and probably also neighbouring species, combine under the name of granulobacter (*b. pectinivorum* and *b. urocephalum*), attack the alimentary matter ingested rich in sugars, glucose, saccharose mannite, pectic bodies, amidon, cellulose; decompose them and form multiple transformations from them which end in the formation of gases : CO_2. H_2. CH_4, etc., which accumulate in the upper part of the rumen or of the acids, butyric acid, etc., which remains in solution in the liquid of the rumen.

All these phenomena produce themselves in the normal state, but with less intensity and in an organ whose motility conserved allows of the regular evacuation of the products. On the contrary, these fermentations become rapid in an organ whose walls are paralysed, and the gases accumulate in abundance in the upper part of the reservoirs.

Let us notice, in passing, that the microbian agents in action belong to the group of anærobes, and that the free oxygen hinders their vitality ; this tenet is of great importance from a therapeutic point of view.

Treatment.—Numerous internal drugs have been recommended. They are described in special works. Some of them are not exempt from danger ; other agents, after their absorption, may impregnate the meat and render it useless if the patient dies in the course of the malady.

Among surgical interventions preference is given to puncture of the rumen, practised with a trocar of average size, which allows of evacuation of gas, and avoids the accidents of asphyxia and intoxication. But if the trocar is withdrawn too soon, gas forms again and the animal blows up anew. To avoid this, the canula is left in place for twelve hours or longer, and antiseptic remedies are given which hinder renewed fermentation. The first of these measures may result in accidents, abscess or peritonitis ; the second is of doubtful efficacy and the drugs administered may result in rejection of the

carcase for meat if slaughter becomes necessary. Delmer believes in the use of oxygenated water, and considers that it is quite harmless to the patient.

The hydrogen peroxide of commerce is acid, and on this account already antiseptic; it possesses, besides, the property of decomposing in contact with certain substances and giving off oxygen; it acts thus when in contact with vegetable tissues; those, in fact, above all, in the young state, rich in diastase; decompose hydrogen peroxide and set at liberty molecular oxygen, whose oxidising properties are energetic. This phenomenon is much dependent on a diastase, for if vegetable tissues are first of all submitted to boiling temperature, decomposition of hydrogen peroxide is no longer produced.

The author has frequently injected up to two litres of oxygenated water without it producing any trouble or interfering even with digestion. After puncture of the rumen and evacuation of gas, the author injects, according to the size of the animal, one to two litres of the hydrogen peroxide of commerce at ten to twelve volumes, at a temperature of 25 to 30 deg. C. There is no risk thus of accidents of asphyxia, and one avoids the return of flatulence. At the same time, the use of this remedy does not preclude the employment of drugs which awaken the contractility of the walls of the rumen and re-establish the regular course of the digestive functions.—G. M. —*Revue Générale de Méd. Vet.*

MASTITIS.

CASES of mammitis have been very frequent lately and there has been much discussion in our ranks and in the Veterinary press on the subject recently. The following abstract from a paper by Dr. J. N. Frost, Assistant Professor of Veterinary Surgery, which appears in the New York State Veterinary College Report, will we feel sure, be of interest. The paper is entitled "Formalin in the Treatment of Mastitis." Dr. Frost based his treatment on the fact that drugs given by the mouth are excreted by the udder in the milk. He had already cured some cases of streptococcic mastitis with turpentine and methylene, but blue considered that something stronger was needed. He began dosing his cases with one drachm of formalin three times daily and alternated it with one ounce of turpentine twice daily. As this produced no bad effects the dosage was gradually increased to one ounce daily, and this Frost believes is the correct dose. The dose was given undiluted in capsule and also with milk or oil. In combination with the latter the laxative effect of the oil is beneficial in mastitis. Purgatives and diuretics are also useful to supplement the formalin treatment. When one drachm of formalin was given faint

traces could be found in the milk in 24 hours. When 25 c.c. of formalin was given 3 hours after water and 7 hours after milking it was found in the milk two hours afterwards and was present from the 18th to the 30th hours. Suspensory bandages and fomentations were used to the udder. Five cases are given which all terminated successfully. The cultures made from the milk and material obtained from an abscess showed various infections, such as streptococci, mixed growths, micrococci and b. coli. Cures resulted in from 5 to 9 days and observation on some of the cows showed that the result was lasting. In some of the cases one ounce of formalin was given and then followed by one drachm doses three times daily, alternated with one ounce of turpentine twice daily G. M.

Personal.

At the Brigade Horse Transport Sports, held April 21st in the Forward Area of the Army of Occupation, Italy, three out of the five contests were won by members of the 1/1 South Midland Veterinary Mobile Section.

Capt. G. Green, R.A.V.C. (Officer Commanding), won the first prize in the officers' bending race for polo ponies—a silver cigarette case.

Pte. T. S. Peart, R.A.V.C., won first prize in the post and ball race—a silver cigarette case and silver matchbox.

A./Corp. C. Fleming, R.A.V.C., was second in the jumping competition " for other ranks "—a silver-mounted Gilette razor.

In the jumping competition open to the Army of Occupation, held about a month ago, Capt. Green took first prize with his well-known charger " Pioneer," and in the race meeting held at Villaverla, March 20th and 21st, open to all the British Forces in Italy, two horses of this Veterinary Mobile Section—" Avanti " and " Fife and Drum "—won three firsts and one second between them.

NOTICES.

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